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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/811,607

03/29/2004

Sang Hun Lee

42P19028

2832

8791

7590

12/05/2005

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EXAMINER

NGUYEN, THONG Q

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 12/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

7

Office Action Summary	Application No.	Applicant(s)	
	10/811,607	LEE ET AL.	
	Examiner	Art Unit	
	Thong Q. Nguyen	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/29/05</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings contained seven sheets of figures 1-6 were received on 3/29/2004. These drawings are objected by the Examiner for the following reason(s).
2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, *the feature related to a mirror having multilayers having a substrate and plurality of bi-layers as claimed in each of claims 1, 6, 11, 17, 20 and 24* must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

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the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

4. The disclosure is objected to because of the following informalities: *Page 8, the values of thicknesses of layers provided in Table 1, last three lines are unclear due to the overlapping of words on the values. See a copy of page 8 of the specification which is marked as "A" on the top of the page which copy is attached with this Office action. Applicant should provide a substitute page for the page 8.* Appropriate correction is required.

5. The specification is objected to because *it does not have a Summary of the invention* as required by 37 CFR 1.73. See also MPEP 608.01(d).

6. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: The specification does not provide support for the feature related to the material of the layers as recited in claim 10.

Applicant should note that the specification refers to materials of molybdenum and beryllium (Mo/Be) in page 2; however, the materials disclosed in page 2 is for the multilayered mirror of the prior art. The descriptions of the invention as provided in

pages 4-10 does not provide any information related to the use of the materials of molybdenum and beryllium for the multilayer mirror of the invention.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 4-10, 16-19 and 23-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a) Claim 4 is indefinite for the following reasons: First, the feature thereof "the relative phase shift" (lines 1-2) lacks a proper antecedent basis; and Second, the mentioned feature is indefinite because it is unclear about the meter/bound of the feature claimed.

b) Claim 5 is indefinite by the recitation thereof "the ML mirror comprises a 13.5 nm central wavelength" (lines 1-2). The mentioned recitation is indefinite because it is unclear how a mirror comprises a wavelength. The Examiner is of opinion that the claim should be amended to recite that the ML mirror reflects light having a 13.5 nm wavelength.

c) Claim 6 is indefinite for the similar reason as set forth in element b) above. In other words, the claim is indefinite because it is unclear how a plurality of bi-layers provide a wavelength. The Examiner is of opinion that the claim should be amended to recite that the plurality of bi-layers reflect light having a 13.5 nm wavelength.

d) Claim 7 is misdescriptive of the invention as taught in the specification, in particular, page 8, Table 1. Applicant should note that the specification discloses an embodiment of the multilayer mirror having 72 layers or 36 bi-layers in which each layer has a particular thickness. The specification has never disclosed that the layer of the bi-layers has a variable thickness. Applicant should further note that a difference in thickness between two layers does not mean that the layers have variable thicknesses. Should the terms 'a variable thickness' (lines 1-2) be changed to --different thicknesses--?

e) Claim 15 is rejected under 35 USC 112, second paragraph for the similar reasons as set forth in element a) above.

f) Each of claims 16 and 23 is rejected for the similar reason as set forth in element b) above.

g) Each of claims 17 and 24 is rejected for the similar reason as set forth in element c) above.

h) Each of claims 18 and 25 is rejected for the similar reason as set forth in element d) above.

i) The remaining claims are dependent upon the rejected base claims and thus inherit the deficiencies thereof.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Yakshin et al (EP 1348984, submitted by applicant).

Yakshin et al disclose an optical broad band element. The element as described in pages 3-4 and 6 and shown in figures 2 and 4-6 comprises a multilayer mirror for reflecting light in an extreme ultraviolet wavelength. In particular, the multilayer mirror comprises a substrate and a set of alternative layers formed on the substrate. Regarding to the range of angles which the mirror reflects with a uniform level and small phase shifts, the mirror as provided by Yakshin et al can provide a uniform reflection of extreme ultraviolet wavelength of 13.4 nm up to 20 degrees without a significant loss of reflectivity.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 3-4, as best as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al (EP 1348984, submitted by applicant).

Yakshin et al disclose an optical broad band element. The element as described in pages 3-4 and 6 and shown in figures 2 and 4-6 comprises a multilayer mirror for reflecting light in an extreme ultraviolet wavelength. In particular, the

multilayer mirror comprises a substrate and a set of alternative layers formed on the substrate. See pages 2-3. Regarding to the range of angles which the mirror reflects with a uniform level and small phase shifts, the mirror as provided by Yakshin et al can provide a uniform reflection of extreme ultraviolet wavelength of 13.4 nm up to 20 degrees without a significant loss of reflectivity. See pages 3 and 4, section [0032], for example. It is also noted that a change in thicknesses of the layers of the mirrors will result a change including an increase in phase shift of the reflected light.

Regarding to the value of the loss in reflectivity as recited in present claim 3, such feature is read in the data provided in the figures 5 and 6 in comparison with the data provided in figure 4 of the present application. In other words, the difference in reflectivity at the angle of 18 degrees and that of 20 degrees as shown in each of figures 5 and 6 is about 20 % with is closed to the value as provided in the figure 4 of the present application. It is also noted that the thickness of the layers as provided by Yakshin et al is able to change as can be seen in pages 3-4, it would have been obvious to one skilled in the art at the time the invention was made to modify the multilayer mirror as provided by Yakshin et al by adjusting the thicknesses of the layers to reduce the loss of the reflectivity of the mirror in a desired/particular range or value.

13. Claims 5-9, 11-13, 15-21 and 23-26, as best as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al (EP 1348984) in view of Mann et al (Pub. US 2003/0099034, submitted by applicant).

Yakshin et al disclose an optical broad band element. The element as described in pages 3-4 and 6 and shown in figures 2 and 4-6 comprises a multilayer mirror for reflecting light in an extreme ultraviolet wavelength. In particular, the multilayer mirror comprises a substrate and a set of alternative layers formed on the substrate. See pages 2-3. Regarding to the range of angles which the mirror reflects with a uniform level and small phase shifts, the mirror as provided by Yakshin et al can provide a uniform reflection of extreme ultraviolet wavelength of 13.4 nm up to 20 degrees without a significant loss of reflectivity. See pages 3 and 4, section [0032], for example. It is also noted that a change in thicknesses of the layers of the mirrors will result a change including an increase in phase shift of the reflected light. The multilayers formed on the substrate of the mirror as provided by Yakshin et al are constituted by Mo/Si bilayers. Yakshin et al do not state that the multilayer mirror is used as a third mirror in a system having six mirrors for copying a mask into a wafer as claimed.

However, the use of a multilayer mirror as a third mirror in an optical system having six mirrors for imaging a mask onto a wafer is known to one skilled in the art as can be seen in the system provided by Mann et al. See pages 1-2 and 4-5. In particular, the system provided by Mann et al comprises six mirrors wherein the third mirror is a broad band multilayer mirror. See page 5. The multilayer mirror described in page 4 comprises forty alternative bilayers of Mo/Si for reflection light at 13.4 nm. While Mann et al do not clearly state that their system is used to reflect light at 13.5 nm as claimed; however, it would have been

obvious to one skilled in the art to modify the system by shifting the peak reflectivity of the multilayer mirror from 13.4 nm to 13.5 nm to increase the change sensitivity by changing the thickness. Regarding to the number of bilayers as claimed in claims 8, 19 and 26, it is also within the level of one skilled in the art to change the number of bilayers used to constitute the mirror for the purpose of varying the reflection intensity. Thus, it would have been obvious to one skilled in the art at the time the invention was made to utilize the broad band multilayer mirror as provided by Yakshin et al in a system having six mirrors as provided by Mann et al for the purpose of improving the imaging of a mask onto a wafer with high quality.

14. Claims 14 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al (EP 1348984) in view of Mann et al (Pub. US 2003/0099034).

The combined product as provided by Yakshin et al and Mann et al does not clearly state the value of the loss in reflectivity as recited in present claims 14 and 22. However, such feature related to the loss in reflectivity as claimed is read in the data provided in the figures 5 and 6 in comparison with the data provided in figure 4 of the present application. In other words, the difference in reflectivity at the angle of 18 degrees and that of 20 degrees as shown in each of figures 5 and 6 is about 20 % with is closed to the value as provided in the figure 4 of the present application. It is also noted that the thickness of the layers as provided by Yakshin et al is able to change as can be seen in pages 3-4, it would have been obvious to one skilled in the art at the time the invention was made to modify the

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multilayer mirror as provided by Yakshin et al by adjusting the thicknesses of the layers to reduce the loss of the reflectivity of the mirror in a desired/particular range or value.

15. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al and Mann et al as applied to claim 6 above and further in view of Hudyma et al (US Patent No. 6,188,513).

The combined product as provided by Yakshin et al and Mann et al does not disclose that the material of the bilayers are Mo/Be as claimed. However, the use of material Be in lieu of Si as claimed is merely that of a preferred embodiment as no criticality has been disclosed. The support for that conclusion is found in the present application in which applicant has disclosed and claimed that the material of the bilayers are Mo/Si. See present claim 9. Further, the use of Mo/Be or Mo/Si material to make a broad band multilayer mirror is known to one skilled in the art as can be seen in the system having six mirrors in which the material of the mirror is Mo/Si or Mo/Be. See claim 18. Thus, it would have been obvious to one skilled in the art at the time the invention was made to use suitable material including material of Be as suggested by Hudyma et al for making the bilayers in the multilayer mirror of the combined product provided by Yakshin et al and Mann et al for the purpose of adjusting the reflection level of the device.

Conclusion

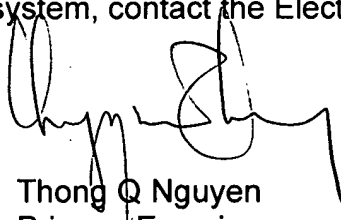
16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thong Q. Nguyen whose telephone number is (571) 272-2316. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew A. Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thong Q. Nguyen
Primary Examiner
Art Unit 2872
